

REMARKS

The Examiner has stated that the use of the word enhanced renders claim 1 confusing and unclear. This term has been deleted.

Claim 1 has also been rejected for use of the terms "suitable fluid" in line 4. Applicants have amended the claim to read suitable liquid to conform to the specification. Applicants contend that any person skilled in the catalyst art would readily be able to determine what a suitable liquid is. Such a liquid would be one that capable of forming a slurry and which does not introduce any known poisons of the Fischer-Tropsch process and is non-reactive at reaction conditions. Hence, Applicants contend the terminology is clear. This likewise applies to the use of the terms suitable solvent in step c of claim 1. One skilled in the art would readily be able to select solvents in which the reducible salts are soluble and which will not interfere with the preparation of the catalyst.

Applicants contend that step (a) of claim 1 is clear as now written. The metals utilizable for DAM catalysts are well known to those skilled in the art as documented in the background section of the specification. In the instant invention, all that is necessary is that the DAM be capable of forming a metal oxide with a different oxidation state in the solvent liquid. One skilled in the art would readily be able to determine this.

Applicants further contend that the use of the terminology "for a time such that the metals no longer exhibit uncontrollable pyrophoricity is clear to the skilled artisan. The pyrophoricity is readily observable during the procedure. Uncontrolled pyrophoricity is commonly understood to mean fire. Therefore, Applicants contend that the claims are clear as written.

Applicants have corrected the other items noted by the Examiner in the claims.

The Examiner rejects the claims relying on a primary reference to Kibby. However, those skilled in the art will readily recognize that although Kibby teaches a unique zeolite catalyst, the catalyst of Kibby is not a DAM catalyst as taught by the instant invention. Indeed, DAM catalyst are recognized as a distinct class of catalyst by the art (as discussed in the Background of the Invention) and have characteristics which significantly differ from those of other types of catalysts such as that of the Kibby reference. Applicants therefore contend that the Kibby reference is more akin to non-analogous art with regard to the instant invention.

The Examiner rejects Claims 14 and 16 as anticipated by or, in the alternative, as obvious over Kibby et al. Kibby teaches the activation of a cobalt silicoaluminate catalyst useful as a Fischer-Tropsch catalyst. The synthetic aluminosilicate is prepared with a cobalt substituent in the crystal lattice by a hydrothermal process which correspond to a very specific state of the cobalt atoms, i.e., cobalt cations included in the lattice of a crystalline aluminosilicate. The present catalysts are derived from dispersed active metal catalyst where the cobalt is present in the form of a metallic metal. Even an extensive reduction of the cobalt aluminosilicate as disclosed by Kibby would not lead to the formation of a dispersed active metal as defined in the present application. Regarding the statement that the present invention is anticipated or obvious, it is well known that the activity and selectivity of heterogeneous

metal catalysts are highly dependent upon the morphology and the dispersion of the metal particles. This is true regardless of whether the catalyst is supported or unsupported and one skilled in the art would in fact anticipate that the metal particles formed in both inventions would be widely different as taught by Mauldin-US 4992406 (see data in examples). Furthermore, one skilled in the art knows that the applications of pre-treatments also greatly affects the performance of a catalyst and in our invention the pre-treatments steps are significantly different from the pre-treatments disclosed by Kibby et al. Therefore, one skilled in the art would readily recognize that Kibby could not have anticipated the present invention. **For similar reasons the addition of a group VIII metal to the pretreated catalyst and the enhancement of the catalyst performance is unpredictable because such group VIII metal would be supported on materials with different structures and compositions, hence leading to metal particles with different composition, structure, morphology and dispersion as taught by Mauldin.**

Claims 15 & 17 are rejected as anticipated over Mauldin. Once again, Mauldin discloses the promotion of supported cobalt catalyst by addition of Rhenium. In the present invention, the rhenium is added to a dispersed active metal in which no refractory oxide support is present. If the catalytic components are the same, it is well known that their activity and selectivity are highly dependent upon the structure, morphology and dispersion of the metallic particles, which are highly affected by the presence of a support as taught by Mauldin. Hence, the performance of a non-supported catalyst promoted by Rhenium is unpredictable.

Claims 1-4, 7 & 13 are rejected as unpatentable over Kibby. Kibby discloses a process, which requires a minimum of 3 stages, a reduction, an oxidation and a final reduction. The addition of a promoter is then achieved by incorporating a fourth stage between the oxidation and the final reduction. The instant invention teaches a maximum of 3 stages including incorporation of the promoter. Because of the use of a dispersed active metal, the very first stage, i.e. the initial reduction taught by Kibby is not needed at all! Furthermore, the second stage disclosed by Kibby does not require the catalyst to be oxidized in a slurry. One skilled in the art would readily recognize that the oxidation stage as taught by Kibby cannot be practiced to oxidize dispersed active metals since their highly pyrophoric nature would result in an immediate fire upon contact with air as taught by Kibby. Even if one would consider using highly diluted air, such stage would be impractical because it would require several days to complete. The addition of the slurry is critical to achieving an oxidation stage in reasonable times when using active dispersed metals. Furthermore, the oxidation of the active metal in a slurry leads to a different chemistry, which is related to the wet corrosion of metals (or rusting) rather than their conversion to a stable oxide as taught by Kibby. This is explicitly stated in step b) of claim 1 by "forming an oxidized catalyst precursor comprising said metals and at least one of hydroxides thereof." The hydroxides cannot be obtained by sole contact with air or diluted air. Once again, the presence of the slurry is critical when using dispersed active metals. In claim 1, step c) of the instant invention the promoter is impregnated on a substrate that is fundamentally different in composition, structure and morphology from those of the cited prior art. As stated above, the performance of a catalyst is highly dependent on the method of preparation and such performance cannot be anticipated by the teaching of Kibby. Regarding the Examiners arguments pertaining to the individual steps of the instant claims as they relate to the Kibby reference, one skilled in the art would readily recognize that it is the combination of steps, and not each individual step standing on its own which lead to the

catalysts of the present invention. As explained above the catalyst taught by Kibby is fundamentally different from that of the present invention even though certain of the steps taken individually may appear to be similar. It is the combination of the steps that Applicants are claiming.

Regarding Claim 7, the recitation of step b) is not met by the teaching of the reference because Kibby does not oxidize the catalyst in a slurry which is a necessary step in Applicants' claim.

Regarding claim 13, the claim has been amended to read "heating in hydrogen " not "in air" as stated in step e) of claim 1.

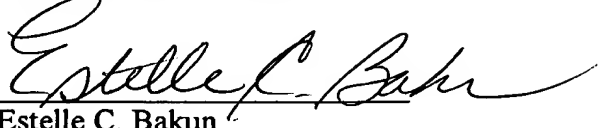
Claims 8, 9 & 12 stand rejected as unpatentable over Kibby as applied to Claim 1-4, 7 & 13 and in further view of Behrmann. As explained previously, the instant invention is significantly different from the teachings of Kibby. Regarding the relevance of Behrmann, the drying step is an inherent requirement in the completion of the preparation of a catalyst and does not represent an inventive step on its own. It is in the context of the whole sequence a) to e) that the step is implemented and defined. However, the sequence itself which includes all of the steps a-e are not disclosed by Behrmann. Again, the invention must be viewed as a whole and not dissected into individual steps. It is the combination that leads to the unique catalyst of the invention. Regarding the use of cobalt nitrate, Kibby neither claims or discloses the use of cobalt in the impregnation step. In fact, Kibby specifically disclosed that the metal is chosen among silver, gold or a group VII metal selected from platinum, palladium, ruthenium, and iridium. The disclosure is silent on the use of non-noble metals of group VIII.

Claim 10 stands rejected as unpatentable over Kibby as applied to claim 1-4, 7 & 13 and in further view of Mauldin. The above arguments apply equally here. The teachings of Mauldin are specific to the impregnation of Rhenium compounds on a support. The instant catalysts, which are dispersed active metals, do not comprise a support. Hence, the effect of adding rhenium to a dispersed active metal is unpredictable as stated above.

Claim 11 stands rejected as unpatentable over Kibby as applied to claim 1-4, 7 & 13 and in further view of Manzer. The combination of the further references to the Kibby reference does not cure the underlying deficiencies of Kibby noted above. The teachings of Manzer are specific to the preparation of a Ruthenium catalyst by stabilization of a colloidal mixture comprising a colloidal sol of a matrix metal selected from the group consisting of cerium, zirconium, aluminum, silicon, and combinations thereof. The instant invention does not include any colloidal sol of a matrix metal and only incorporates an impregnation step with RuCl_3 on a dispersed active metal, which effect on the catalyst performance is unpredictable as stated above.

In view of the foregoing comments, Applicants believe the Application is in condition for allowance and respectfully request such favorable action.

Respectfully submitted,



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☒ Pursuant to 37 CFR 1.34(a)

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PATENT TRADEMARK OFFICE

AMENDED CLAIM WITH MARKINGS

1. A process for the formation of [an enhanced] a dispersed active metal (DAM) catalyst for conducting hydrogenation reactions comprising:

a) forming a slurry of particulate DAM catalyst characterized by the capacity to form more than one oxide of the DAM in a suitable [fluid] liquid;

b) contacting the particulate DAM catalyst in the slurry with an oxidizing agent at temperatures below 200°C [for a time such that the metals no longer exhibit uncontrollable pyrophoricity, thereby] to form[ing] an oxidized catalyst precursor comprising said metals and at least one of hydroxides thereof and oxides thereof, wherein at least a portion of said hydroxides and oxides are in the lower oxidation state of the metals;

c) adding to said oxidized catalyst precursor a solution in a suitable solvent of one or more reducible salts of promoter metals selected from the group of rhenium, ruthenium, palladium, iron and cobalt;

d) recovering and drying said oxidized catalyst precursor and said salt;  
and

e) forming an active catalyst by treating the oxidized catalyst precursor with hydrogen at elevated temperature, wherein said one or more salts will be reduced during the hydrogen treatment to form the metal.

8. A process in accordance with Claim 1, wherein in step d) [the mixture of] said oxidized catalyst precursor and said one or more salts is dried in air at a temperature above 100°C for at least one hour.

9. A process in accordance with Claim 1, wherein in step d) [the mixture of] said oxidized catalyst precursor and said one or more salts is dried under an inert atmosphere.

13. A process in accordance with Claim 1, wherein step e) is heating [said mixture] in [air] hydrogen to a temperature of about 400° for a time sufficient to form the promoter metal from said one or more reducible salts thereof.

14. A[n enhanced] catalyst formed by the process of Claim 1.

15. A[n enhanced ]catalyst in accordance with Claim 14, wherein said promoter metal is rhenium.

16. A[n enhanced] catalyst in accordance with Claim 14, wherein said promoter metal is ruthenium.

17. A[n enhanced] catalyst in accordance with Claim 14, wherein said promoter metal is cobalt.